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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the substrate lamination equipment used in case a substrate is stuck in the manufacture approach of the liquid crystal display component used for OA equipment, such as a personal computer, a word processor, and a monitor display, the information communication equipment of a pocket mold, etc., and manufacture of such a liquid crystal display component.
[0002]
[Description of the Prior Art] A liquid crystal display component is the configuration that the substrate of the pair which formed an electrode, the orientation film, etc. in each was stuck, and liquid crystal was enclosed between the substrates of this pair. A polarizing plate and other optical films are installed in the both sides of the substrate of a pair if needed. With liquid crystal mode, there is a polarizing plate, one sheet or also when two sheets are prepared or it is not used.
[0003] In the case of a transparency mold, from the opposite side of the screen, the liquid crystal display component of structure which was described above irradiates light, and displays it with a three-wave mold cold cathode tube etc. In the case of a reflective mold, it displays by installing a reflecting plate in the opposite side of the screen, and reflecting outdoor daylight. With such a gestalt, an electrical-potential-difference drive can be carried out and a liquid crystal display component can be used as a display.
[0004] Conventionally, in the production process of a liquid crystal display component, the impregnation method and the dropping method are learned as an approach of forming a liquid crystal layer between the substrates of a pair. Generally the former impregnation method is suitable for mass production, and is filled up with liquid crystal from opening of an empty cel by capillarity and differential pressure in a vacuum. On the other hand, a dropping method trickles liquid crystal beforehand on one substrate, and sticks the substrate of another side on this in a vacuum. An all directions type completes a liquid crystal panel through the process which sticks the substrate of a pair.
[0005] Here, the conventional manufacture approach of the liquid crystal display component by the impregnation method is explained, referring to drawing 10 . First, after washing the substrate which prepared the display electrode (P51 in drawing 10) and applying liquefied orientation material by offset printing etc., the orientation film is formed through temporary baking and book baking (P52). Furthermore, orientation processing by rubbing etc. is performed to the orientation film (P53). Generally, in order to remove a surface foreign matter and dirt after rubbing, backwashing by water is carried out (P54).
[0006] And a seal pattern is formed by applying the sealant for closing liquid crystal to one of substrates by drawing equipment, screen-stencil, etc. (P55a). Furthermore, spot printing of the UV resin for [tacking] is carried out by a dispenser etc. out of the field of a liquid crystal display component. Moreover, to another substrate, in order to form a gap, the spacer of predetermined magnitude is sprinkled (P55b).
[0007] Next, both substrates are stuck in atmospheric air (P56). In case it sticks, it enables it to recognize

optically the alignment mark beforehand prepared on the electrode in both substrates. And when an alignment mark agrees, ultraviolet rays are irradiated and UV resin for [tacking] is stiffened.
[0008] Then, in order to perform gap control of a liquid crystal display component, the whole substrate of the pair by which it was tacking carried out is pressurized with the Ayr press etc., and a sealant is stiffened in the place out of which the optimal gap came (P57). In using the sealant of a heat-curing mold at this time, heat is applied by the heater wires installed in the surface plate of the Ayr press, and it hardens a sealant. When using the sealant of UV hardening mold, generally the method of irradiating ultraviolet rays from the outside of a surface plate in the place out of which the optimal gap came using the plate thick [, such as glass and acrylic material, / transparent], and hardening a sealant is used as a surface plate which performs the Ayr press.
[0009] Then, an empty liquid crystal cell (empty cel) is formed of what (P58) the square besides a substrate viewing area is ****(ed) for. After in the case of an impregnation method doing in this way, putting in the empty cel and liquid crystal reservoir which were completed in a vacuum tub and making 0.2 - 0.7Torr extent describe liquid crystal for the inlet section of an empty cel, it is filled up with liquid crystal in an empty cel by opening the inside of a vacuum tub to atmospheric air (P59).
[0010] And the obturation section is closed by resin etc. (P60), after washing the liquid crystal adhering to a liquid crystal display component, the whole liquid crystal display component is annealed and reorientation processing of liquid crystal is performed (P61).
[0011]
[Problem(s) to be Solved by the Invention] However, by such manufacture approach of the conventional liquid crystal display component, although the hot press and UV press for obtaining the optimal gap were performed when making an empty cel, neither alignment precision nor the precision of the homogeneity within the field of a gap was fully acquired. For this reason, while enlargement of substrate size will progress in the future, it had become a problem how such precision is raised.
[0012] The reason neither the above-mentioned alignment precision nor the precision of the homogeneity within the field of a gap is fully acquired is as follows. First, the alignment process which performs alignment of the substrate of a pair, and the pressurization press process of a gap ****** sake are divided in the lamination process (P56), and it is mentioned that the suitable empty cel is not made. That is, it is because UV resin which once carried out [tacking] at the alignment process separates according to the compulsory force of the pressurization press of degree process, consequently comes out of the width of face of the alignment precision of the marker on the substrate of a pair.
[0013] Moreover, even if the substrate of a pair sticks with a sufficient alignment precision, and is set and it is tacking carried out, when a sealant is heat-curing mold resin, an alignment location may shift from the difference in the coefficient of linear expansion between the substrate of the pair which consists of glass, and the sealant inserted into them by the pressure and temperature change at the time of the hot press in a next seal hardening process. This poses a very serious problem, so that substrate size becomes large.
[0014] On the other hand, when a sealant is UV resin, where a desired gap is formed with a pressurization press, ultraviolet rays are irradiated from the outside of a transparent surface plate, but a surface plate is heated with the radiant heat by UV irradiation, and the surface plate itself carries out a temperature rise as activity number of sheets increases. For this reason, since only the substrate in contact with a surface plate carries out a temperature rise and there is no temperature change in another substrate, it will be in the condition that the temperature gradient arose between the substrates of a pair. If the sealant between the substrates of the pair by which UV irradiation was carried out hardens with this condition, it will be stuck after the substrate of a pair has curved and gap unevenness will arise for a liquid crystal display component. This problem also becomes so serious that substrate size becomes large.
[0015] As mentioned above, there was a problem that it was difficult to reconcile conventional alignment precision sufficient by the manufacture approach and gap precision, and could not respond to the substrate size to be enlarged from now on.
[0016] This invention solves the conventional trouble which was described above with enlargement of the substrate size for realizing the liquid crystal display component of 20 molds for which the LCD monitor

which becomes an alternative of CRT is asked etc., raises the homogeneity within a field of the precision of a narrow gap, and a gap, and alignment precision, and aims at offering the liquid crystal display component in which a bright high-definition display is possible.

[0017]

[Means for Solving the Problem] In order to attain this purpose, the manufacture approach of the liquid crystal display component of this invention It sets at the same process as said 2nd process including the 1st process which arranges the convention member which specifies a cel gap at least to one side of the substrate of the pair which sandwiches liquid crystal, and the 2nd process which carries out location adjustment of the substrate of said pair. It is characterized by pressurizing so that the cel gap of the substrate of said pair may become predetermined magnitude.

[0018] According to this approach, within the same process, since alignment of the substrate of a pair and gap control are carried out, neither an alignment gap nor a blank happens in the case of gap ****, and the curvature of a liquid crystal display component is not generated, either. Thereby, the homogeneity in the gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.

[0019] As for said 2nd process, it is desirable to carry out within the ambient atmosphere adjusted to the predetermined pressure. By this approach, alignment precision can be raised further. The surface plate of a pair with which at least one side was prepared possible [displacement] in said 2nd process, It is desirable to make one side of the substrate of said pair hold by the electrostatic chuck of one [said] surface plate, to make the substrate of another side hold to the surface plate of another side using the lamination equipment which has the electrostatic chuck prepared at least in one side of the surface plate of said pair, and to perform said location adjustment and pressurization.

[0020] According to this approach, since at least one side of the substrate of a pair is certainly fixed by the electrostatic chuck, alignment precision can be further raised by it. Moreover, it is desirable to include the process which discharges the substrate held at said electrostatic chuck after said 2nd process.

[0021] Since the charge which remained to the substrate by which the electrostatic chuck was adsorbed is removable according to this approach, an electrostatic discharge can be prevented. Moreover, it is desirable to include the process which forms the pattern for removing static electricity at least to one side of the substrate of said pair before said 2nd process. Since the charge which remained by this to the substrate by which the electrostatic chuck was adsorbed is removed by this pattern, an electrostatic discharge can be prevented.

[0022] Moreover, said convention member is a granular spacer and it is desirable that said 1st process includes the process which sprinkles said spacer. According to this approach, a convention member can be easily formed by spraying of a spacer. Thereby, a manufacturing cost can be held down low.

[0023] In addition, as for said spacer, it is desirable to have an adhesive property. According to this approach, since a spacer fixes to a substrate, gap precision improves. Said convention member is the projection which has predetermined height, and it is desirable that said 1st process includes the process which forms said projection by the photolithography.

[0024] Since the projection with predetermined height can be formed in a desired location by the photolithography according to the approach of this, in said 1st process, it is desirable to form a convention member in a color filter and coincidence. According to this approach, a convention member can be formed easily, without increasing a production process.

[0025] Moreover, it is desirable to include the process which forms the mark used for location adjustment in the substrate of said pair before said 2nd process. According to this approach, alignment precision can be raised further.

[0026] Moreover, it is desirable to include the process which performs location adjustment of the substrate of said pair once [at least] after said 2nd process. According to this approach, alignment precision can be raised further.

[0027] Moreover, it is desirable to include the process which trickles liquid crystal before said 2nd process at least at one side of the substrate of said pair. According to this approach, compared with an

impregnation method, an efficient production line with short tact time and lead time can be built, and there is an advantage of there being also little amount of the liquid crystal used, and ending.
[0028] Moreover, it is desirable to include the process which applies liquid crystal before said 2nd process at least at one side of the substrate of said pair. According to this approach, compared with an impregnation method, an efficient production line with short tact time and lead time can be built, and there is an advantage of there being also little amount of the liquid crystal used, and ending.
[0029] Moreover, it is desirable to include the process which pours in liquid crystal between the substrates of said pair after said 2nd process. According to this approach, since it is hard to produce air bubbles in liquid crystal, the yield can be raised.
[0030] Moreover, in order to attain the above-mentioned purpose, the substrate lamination equipment of this invention is characterized by having the pressurization means stuck with predetermined spacing, carrying out location adjustment of the substrate of the pair made to hold to a pressure tub, the surface plate of the pair which at least one side is prepared in the interior of said pressure tub possible [displacement], and holds the substrate of a pair, and the surface plate of said pair.
[0031] By this configuration, since alignment of the substrate of a pair and gap control can be carried out within the same process, neither an alignment gap nor a blank happens in the case of gap ****, and the curvature of a liquid crystal display component is not generated, either. Thereby, the homogeneity in the gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.
[0032] It is desirable to have equipped at least one side of the surface plate of said pair with the electrostatic chuck which adsorbs a substrate. According to this configuration, since at least one side of the substrate of a pair is certainly fixed to a surface plate by the electrostatic chuck, alignment precision can be further improved by it.
[0033] Moreover, it is desirable to have had further the monitor means for checking the location of the substrate of said pair. Since alignment can be performed according to this configuration, checking the location of the substrate of a pair, alignment precision can be raised further.
[0034]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.
(Gestalt 1 of operation) The outline structure of the liquid crystal display component 1 of the operation gestalt 1 of this invention is shown in drawing 1 . This liquid crystal display component 1 is equipped with substrate 2a and 2b of a pair. In the field which counters substrate 2b in substrate 2a, two or more display electrode 5a-- is arranged in parallel mutually. In the field which counters substrate 2a in substrate 2b, two or more display electrode 5b-- is arranged in parallel mutually. In addition, display electrode 5a and display electrode 5b are arranged so that it may intersect perpendicularly mutually. Display electrode 5a is covered with orientation film 7a. Display electrode 5b is covered with orientation film 7b.
[0035] Between substrate 2a and 2b, a spacer 4 distributes and is arranged so that a predetermined gap may be formed. It fills up with liquid crystal 3 between substrate 2a and 2b, and it is enclosed by the sealant 6 so that the above-mentioned gap may be buried. This sealant 6 is applied along with the periphery of substrate 2a and 2b. As a sealant 6, ultraviolet curing die materials, such as heat-curing die materials, a radical, a cation mold, etc. which consist of an epoxy resin, can be used.
[0036] The polarizing plate and the other optical films which are not illustrated in the outside of substrate 2a and 2b if needed are arranged in a suitable location. As the above-mentioned substrate 2a and 2b, a color filter substrate, the array substrate which arranged the active component, the substrate in which the transparent electrode was formed, etc. are used.
[0037] In order to make the gap in a cel into a predetermined value, the thing which consist of resin system ingredients, such as benzoKUANAMIN, or SiO2 and for which the spacer of the shape of spherical or a rod is used is desirable as a spacer 4. Moreover, in order to raise the homogeneity of a gap, it is desirable to give an adhesive property to a spacer 4 and to make substrate 2a and 2b fix.
[0038] Here, the manufacture approach of the liquid crystal display component 1 is explained, referring to

the flow chart of drawing 2 R> 2. In addition, the liquid crystal display component 1 of this operation gestalt is created by the impregnation method so that it may explain below.

[0039] First, substrate 2a and 2b which formed display electrode 5a and 5b by the well-known approach, respectively are washed (P1 shown in drawing 2). Liquefied orientation material is offset to substrate 2a and 2b after washing, it is dried at an elevated temperature, and orientation film 7a and 7b are formed, respectively (P2). And rubbing processing of the front face of this orientation film 7a and 7b is carried out with a buff (P3), and when a foreign matter is shown in a front face, it lets a washing process pass (P4).

[0040] In this way, a seal pattern is formed by applying a sealant 6 to one of substrates (here, referred to as substrate 2a) by drawing or printing among the made substrates (P5a). To the substrate (here substrate 2b) of substrate 2a or another side, a spacer 4 is sprinkled at homogeneity (P5b).

[0041] And in order to make it flow through the common electrode prepared in either substrate 2a or 2b, and the electrode prepared in another side, a dispenser is used and the spot of conductive resin is applied to several places of the outside of a sealant 6. In addition, what is necessary is to be the magnitude of diameter extent of about 1mm or less, and just to form them in the pitch of about 15mm depending on panel size, if the magnitude and the number of a spot of these conductive resin are the case of the panel of 10 inches of vertical angles.

[0042] Next, substrate 2a and 2b are stuck using the substrate lamination equipment shown in drawing 3 (P6). This equipment is press equipment which has the surface plate 9-10 of a vertical pair in the vacuum tub 8. The surface plate 9-10 is formed possible [displacement of at least one side]. The electrostatic chuck 11 is formed in the surface plate 9. Moreover, this equipment is equipped with the recognition camera (monitor means) which is not illustrated so that substrate 2a and 2b can improve [precision] alignment.

[0043] First, one of substrates (here substrate 2a) is put on the downward surface plate 10, and the substrate (here substrate 2b) of another side is made to stick to the electrostatic chuck 11 of the upper surface plate 9, as shown in drawing 3. And after making the inside of the vacuum tub 8 into a predetermined pressure, the up-and-down surface plate 9-10 is pressurized, and substrate 2a and 2b are stuck. At this time, a location is doubled in a necessary precision, checking location adjustment of the marker of substrate 2a and 2b with a recognition camera. If location adjustment of substrate 2a and the 2b is carried out, the inside of the vacuum tub 8 will be returned to atmospheric pressure. It is made not to drop substrate 2b which the electrostatic chuck 11 of a surface plate 9 held during this activity.

[0044] Next, a sealant 6 is hardened or temporary hardened (P7). Next, the circumference of substrate 2a and 2b is ****(ed) (P8). Thereby, the empty cel of the liquid crystal display component 1 is created. And after putting in an empty cel in the vacuum tub which prepared the liquid crystal reservoir and stabilizing the degree of vacuum in this vacuum tub to some extent, the obturation section of an empty cel is soaked in a liquid crystal reservoir. Then, the inside of a vacuum tub is returned to atmospheric pressure. Thereby, liquid crystal 3 is poured in by the differential pressure and capillarity of empty cel inside and outside into a cel gap (P9). If the liquid crystal of a predetermined amount is poured in, the obturation section will be closed by resin (P10), and the excessive liquid crystal 3 will be washed out. Furthermore, the whole liquid crystal display component 1 is annealed, and reorientation processing of liquid crystal 3 is performed (P11).

[0045] In addition, the electrostatic chuck 11 used at the above-mentioned process P6 separates an insulating layer between an electrode and the substrate made to adsorb, impresses an electrical potential difference to it, and attracts a substrate by making Coulomb force discover among both. Some kinds of the touch-down approaches and configurations in the electrostatic chuck 11 are considered by the class of substrate (here substrate 2b) made to adsorb. For example, as substrate 2b, an array substrate, a color filter substrate, plastics, the substrate of the quality of the material of a film, etc. is used.

[0046] For this reason, in the basic configuration of the electrostatic chuck 11, as shown in drawing 4 (a) - (d), some can be considered according to the conditions of the substrate to which it sticks. First, the electrostatic chuck 11 of the type shown in drawing 4 (a) is equipped with unipolar internal electrode 11a, and is suitable for adsorption of the substrate of a conductor or a semi-conductor. Moreover, when using

this type of electrostatic chuck 11, it is necessary to ground the substrate (here substrate 2b) to which it sticks.

[0047] Moreover, it is not necessary to ground substrate 2b and is suitable for adsorption of the substrate of a conductor or a semi-conductor by the electrostatic chuck 11 of the type shown in drawing 4 (b) and (c). The electrostatic chuck 11 shown in drawing 4 (b) was equipped with the two-dimensional electrode as internal electrode 11a, and the electrostatic chuck 11 shown in drawing 4 (c) is equipped with bipolar internal electrode 11a.

[0048] Moreover, the electrostatic chuck 11 of the type shown in drawing 4 (d) is equipped with internal electrode 11a of a tandem type, and is suitable for adsorption of the substrate of a dielectric. In addition, even if it grounds the substrate (here substrate 2b) to which it sticks, it is not necessary to carry out this type of electrostatic chuck 11.

[0049] Moreover, since a charge may remain on the front face of the substrate to which it stuck while the electrostatic chuck 11 has strong adsorption power, a cure by which an electrostatic discharge is not generated in the substrate after processing is needed. for this reason -- making it discharge not take place by making into the shape of a loop formation pattern leading about on the substrate to which it sticks **** -- Io -- it is desirable to discharge electricity by NAIZA etc.

[0050] As mentioned above, according to the manufacture approach of this operation gestalt, within the same process, since alignment of substrate 2a and 2b and gap control are carried out, neither an alignment gap nor a blank happens in the case of gap ****, and the curvature of a liquid crystal display component is not generated, either. Thereby, the homogeneity in the gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.

[0051] Moreover, since the convention member holding the gap of substrate 2a and 2b can be easily formed by sprinkling a spacer 4, a tact time and lead time are short, and can build an efficient production line.

[0052] (Gestalt 2 of operation) The outline configuration of the liquid crystal display component 21 in the operation gestalt 2 of this invention is shown in drawing 5 . This liquid crystal display component 21 is equipped with the projection 12 with predetermined height in order to make magnitude of the gap between substrate 2a and 2b into homogeneity instead of the spacer 4 of the gestalt 1 of operation.

[0053] This projection 12 is formed on substrate 2a by carrying out patterning of the acrylic photosensitive ingredient etc. by the photolithography method. Moreover, projection 12 can also be formed in a color filter (not shown) and coincidence in piles with any of R, G, B, and BM (black matrix) of this color filter they are. In addition, projection 12 has the desirable direction prepared in addition to a pixel field at the point that a numerical aperture can be obtained greatly.

[0054] More ones of the number of projections 12 (consistency) are desirable at the point whose homogeneity of a cel gap improves. On the other hand, since air bubbles will be generated from the relation between the volume in a cel, and the expansion coefficient of a liquid crystal ingredient when it is left at low temperature 0 degree C or less if there are many projections 12 from a viewpoint of dependability (consistency), it is not so desirable. That is, what is necessary is just to determine a suitable consistency about the consistency of projection 12, according to a desired property, since the relation of a trade-off to the homogeneity of a cel gap and low-temperature gassing is realized. Moreover, the same relation as the consistency of projection 12 is realized also in the magnitude of projection 12, or the degree of hardness of an ingredient.

[0055] If formation of projection 12 is performed to formation and coincidence of a color filter as mentioned above, it is easy. However, in a subsequent process, although we are anxious about the projection 12 -- thickness nonuniformity occurs around projection 12, or poor muscle-like orientation is generated at the time of rubbing -- causing a contrast fall in case orientation film 7a is formed by printing, a poor display can be suppressed with the configuration of projection 12, magnitude, and the location to prepare.

[0056] Moreover, how to form projection 12 on orientation film 7a after rubbing processing of orientation

film 7a is also considered like a configuration of being shown in drawing 6. In this case, since there is a possibility that orientation force may decline when orientation film 7a is polluted with the solvent used by the photolithography at the time of formation of projection 12, it is required to choose the solvent to be used appropriately.

[0057] Between substrate 2a and 2b, it fills up with liquid crystal 3 and is enclosed by the sealant 6. This sealant 6 is applied along with the periphery of substrate 2a and 2b. As a sealant 6, ultraviolet curing die materials, such as heat-curing die materials, a radical, a cation mold, etc. which consist of an epoxy resin, can be used.

[0058] The polarizing plate and the other optical films which are not illustrated in the outside of substrate 2a and 2b if needed are arranged in a suitable location. As the above-mentioned substrate 2a and 2b, a color filter substrate, the array substrate which arranged the active component, the substrate in which the transparent electrode was formed, etc. can be used.

[0059] Here, it explains, referring to the flow chart shown in drawing 7 about the production process of the liquid crystal display component 21. In addition, the same reference mark is attached to the process explained with the operation gestalt 1, and the same process, and the detailed explanation is omitted. Suppose that it is the same also in other operation gestalten mentioned later.

[0060] The liquid crystal display component 21 of this operation gestalt is created by the impregnation method so that it may explain below. First, substrate 2a and 2b in which display electrode 5a and 5b were formed are washed (P1 shown in drawing 5). Orientation film 7a and 7b are formed in substrate 2a and 2b after washing, respectively (P2). And rubbing processing of the front face of orientation film 7a and 7b is carried out with a buff (P3), and it lets a washing process pass (P4).

[0061] In this way, a seal pattern is formed by applying a sealant 6 to one of substrates (here, referred to as substrate 2a) by drawing or printing among the made substrates (P15a). And projection 12 is formed in the substrate (here substrate 2b) of substrate 2a or another side by the photolithography (P15b).

[0062] Next, substrate 2a and 2b are stuck using the substrate lamination equipment shown in drawing 3 (P6). This equipment is press equipment which has the surface plate 9-10 of a vertical pair in the vacuum tub 8. The surface plate 9-10 is formed possible [displacement of at least one side]. The electrostatic chuck 11 is formed in the surface plate 9. Moreover, this equipment is equipped with the recognition camera (monitor means) which is not illustrated so that substrate 2a and 2b can improve [precision] alignment.

[0063] First, one of substrates (here substrate 2a) is put on the downward surface plate 10, and the substrate (here substrate 2b) of another side is made to stick to the electrostatic chuck 11 of the upper surface plate 9. And after making the inside of the vacuum tub 8 into a predetermined pressure, the up-and-down surface plate 9-10 is pressurized, and substrate 2a and 2b are stuck. At this time, a location is doubled in a necessary precision, checking location adjustment of the marker of substrate 2a and 2b with a recognition camera. If location adjustment of substrate 2a and the 2b is carried out, the inside of the vacuum tub 8 will be returned to atmospheric pressure. It is made not to drop substrate 2b which the electrostatic chuck 11 of a surface plate 9 held during this activity.

[0064] Next, a sealant 6 is stiffened (P17). In addition, it considers as the condition of carrying out temporary hardening, without making it hardening completely here depending on the ingredient of a sealant 6, and may be made to carry out actual hardening later.

[0065] Next, the circumference of substrate 2a and 2b is ****(ed) (P8). Thereby, the empty cel of the liquid crystal display component 21 is created. And after putting in an empty cel in the vacuum tub which prepared the liquid crystal reservoir and stabilizing the degree of vacuum in this vacuum tub to some extent, the obturation section of an empty cel is soaked in a liquid crystal reservoir, and the inside of a vacuum tub is returned to atmospheric pressure. Thereby, liquid crystal 3 is poured in by the differential pressure and capillarity of empty cel inside and outside into a cel gap (P9). If the liquid crystal of a predetermined amount is poured in, the obturation section will be closed by resin (P10), and the excessive liquid crystal 3 will be washed out. Furthermore, the whole liquid crystal display component 21 is annealed, and reorientation processing of liquid crystal 3 is performed (P11).

[0066] As mentioned above, according to the manufacture approach of this operation gestalt, within the same process, since alignment of substrate 2a and 2b and gap control are carried out, neither an alignment gap nor a blank happens in the case of gap ****, and the curvature of a liquid crystal display component is not generated, either. Thereby, the homogeneity in the gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.
[0067] Moreover, the projection 12 for controlling the gap of substrate 2a and 2b can be formed in a desired location by a photolithography etc. Therefore, if projection 12 is formed outside a pixel field, a numerical aperture improves and the liquid crystal display component in which a bright display is possible can be offered.
[0068] (Gestalt 3 of operation) The manufacture approach of the liquid crystal display component in the gestalt 3 of operation of this invention is explained below, referring to drawing 8 . In addition, the manufacture approach of the liquid crystal display component of this operation gestalt forms a liquid crystal layer by the dropping method.
[0069] A procedure (P1-P4) until it carries out rubbing processing and washes substrate 2a and 2b in which orientation film 7a and 7b were formed is as the gestalt 1 of operation having explained. Next, a sealant 6 is applied by drawing or printing (P25a), a spacer 4 is sprinkled to homogeneity and one substrate 2a is made to fix it to substrate 2b of another side (P25b-P26b).
[0070] A radical and UV resin of a cation mold are used for a sealant 6. Moreover, since a certain amount of adhesion reinforcement is needed to substrate 2b as a spacer 4, a fixing type thing is used. In addition, instead of using a spacer 4, as the gestalt 2 of operation described, projection 12 may be formed in either [at least] substrate 2a or 2b. And conductive resin is applied in spot by the dispenser on a flow land.
[0071] Next, liquid crystal 3 is dropped at either substrate 2a or 2b (P26a). In this case, as a substrate which trickles liquid crystal 3, the direction of substrate 2a which applied the sealant 6 is suitable. The amount of the dropped liquid crystal 3 is calculable beforehand based on the display area area and gap thickness of a liquid crystal display component. And a pattern is prepared so that liquid crystal 3 may spread in homogeneity, and the liquid crystal [finishing / degassing] 3 is dropped.
[0072] Furthermore, substrate 2a and 2b are stuck using the substrate lamination equipment shown in drawing 3 (P6). This equipment is press equipment which has the surface plate 9-10 of a vertical pair in the vacuum tub 8. The surface plate 9-10 is formed possible [displacement of at least one side]. The electrostatic chuck 11 is formed in the surface plate 9. Moreover, this equipment is equipped with the recognition camera (monitor means) which is not illustrated so that substrate 2a and 2b can improve [precision] alignment.
[0073] First, substrate 2a which trickled liquid crystal 3 is put on the downward surface plate 10, and substrate 2b is made to stick to the electrostatic chuck 11 of the upper surface plate 9. And after making the inside of the vacuum tub 8 into a predetermined pressure, the up-and-down surface plate 9-10 is pressurized, and substrate 2a and 2b are stuck. At this time, a location is doubled in a necessary precision, checking location adjustment of the marker of substrate 2a and 2b with a recognition camera. If location adjustment of substrate 2a and the 2b is carried out, the inside of the vacuum tub 8 will be returned to atmospheric pressure. When location adjustment of a marker is taken at this time, eye tacking may be carried out in spot.
[0074] Next, ultraviolet rays are irradiated only at the sealant 6 between substrate 2a and 2b, and a sealant 6 is stiffened (P7). In order to irradiate ultraviolet rays alternatively only at a sealant 6 at this time, it is desirable to carry out masking in display area. Or it is also effective to perform a local exposure using a laser beam.
[0075] Finally, after performing reorientation processing of liquid crystal 3 at an annealing process (P11), (P8) and the liquid crystal display component 1 are completed by ****(ing) substrate 2a and 2b. As mentioned above, according to the manufacture approach of this operation gestalt, within the same process, since alignment of substrate 2a and 2b and gap control are carried out, neither an alignment gap nor a blank happens in the case of gap ****, and the curvature of a liquid crystal display component is not

generated, either. Thereby, the homogeneity in the gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.

[0076] Moreover, by forming a liquid crystal layer by the dropping method, compared with an impregnation method, a tact time and lead time are short, can build an efficient production line, and have the amount of the liquid crystal used, and the advantage of it being few and ending.

[0077] (Gestalt 4 of operation) The manufacture approach of the liquid crystal display component in the gestalt 4 of operation of this invention is explained below, referring to drawing 9 . In addition, the manufacture approach of the liquid crystal display component of this operation gestalt forms a liquid crystal layer by the dropping method.

[0078] A procedure (P1-P4) until it carries out rubbing processing and washes substrate 2a and 2b in which orientation film 7a and 7b were formed is as the gestalt 1 of operation having explained. Next, a sealant 6 is applied by drawing or printing (P35a), a spacer 4 is sprinkled to homogeneity and one substrate 2a is made to fix it to substrate 2b of another side (P35b-P36b).

[0079] A radical and UV resin of a cation mold are used for a sealant 6. Moreover, since a certain amount of adhesion reinforcement is needed to substrate 2b as a spacer 4, a fixing type thing is used. In addition, instead of using a spacer 4, as the gestalt 2 of operation described, projection 12 may be formed in either [at least] substrate 2a or 2b. And conductive resin is applied in spot by the dispenser on a flow land.

[0080] Next, liquid crystal 3 is dropped at either substrate 2a or 2b (P36a). In this case, as a substrate which trickles liquid crystal 3, the direction of substrate 2a which applied the sealant 6 is suitable. The amount of the dropped liquid crystal 3 is calculable beforehand based on the display area area and gap thickness of the liquid crystal display component 1. And a pattern is prepared so that liquid crystal 3 may spread in homogeneity, and the liquid crystal [finishing / degassing] 3 is dropped.

[0081] Furthermore, substrate 2a and 2b are stuck using the substrate lamination equipment shown in drawing 3 (P6). This equipment is press equipment which has the surface plate 9-10 of a vertical pair in the vacuum tub 8. The surface plate 9-10 is formed possible [displacement of at least one side]. The electrostatic chuck 11 is formed in the surface plate 9. Moreover, this equipment is equipped with the recognition camera (monitor means) which is not illustrated so that substrate 2a and 2b can improve [precision] alignment.

[0082] First, substrate 2a which trickled liquid crystal 3 is put on the downward surface plate 10, and substrate 2b is made to stick to the electrostatic chuck 11 of the upper surface plate 9. And after making the inside of the vacuum tub 8 into a predetermined pressure, the up-and-down surface plate 9-10 is made to approach mutually, and location adjustment of a marker is taken so that substrate 2a and 2b may acquire a predetermined alignment precision (P37). Next, the up-and-down surface plate 9-10 is pressurized (P38). Then, location adjustment of a marker is taken again (P39). And if location adjustment of substrate 2a and the 2b is carried out completely, the inside of the vacuum tub 8 will be returned to atmospheric pressure. When location adjustment of a marker is taken at this time, eye tacking may be carried out in spot.

[0083] Next, ultraviolet rays are irradiated only at the sealant 6 between substrate 2a and 2b, and a sealant 6 is stiffened (P7). In order to irradiate ultraviolet rays alternatively only at a sealant 6 at this time, it is desirable to carry out masking in display area. Or it is also effective to perform a local exposure using a laser beam.

[0084] Finally, after performing reorientation processing of liquid crystal 3 at an annealing process (P11), (P8) and the liquid crystal display component 1 are completed by ****(ing) substrate 2a and 2b. In addition, in the flow chart shown in drawing 9, after performing a pressurization press in a process P38, the alignment process (P39) for the second time is performed only once, but you may carry out by repeating the process and the pressurization press process of taking location adjustment of a marker until a desired alignment precision and a desired cel gap are obtained. Thereby, alignment precision can be raised further.

[0085] As mentioned above, according to the manufacture approach of this operation gestalt, within the

same process, since alignment of substrate 2a and 2b and gap control are carried out, neither an alignment gap nor a blank happens in the case of gap ****, and the curvature of a liquid crystal display component is not generated, either. Thereby, the homogeneity in the gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.

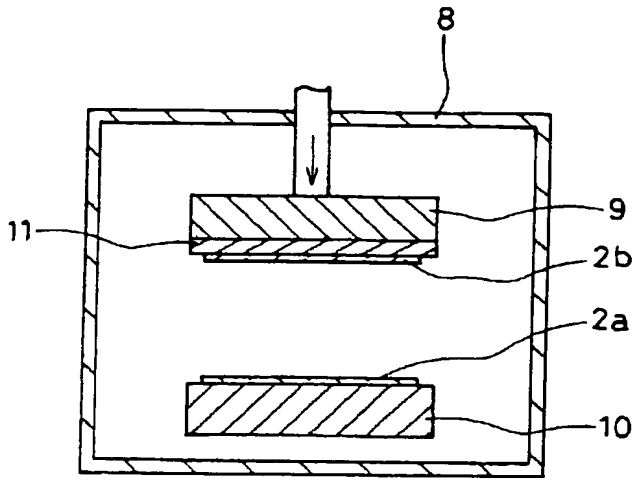
[0086] Moreover, by forming a liquid crystal layer by the dropping method, compared with an impregnation method, a tact time and lead time are short, can build an efficient production line, and have the amount of the liquid crystal used, and the advantage of it being few and ending.

[0087]

[Effect of the Invention] since alignment and gap control are carried out within the same process according to the manufacture approach of the liquid crystal display component of this invention as explained above, the alignment gap or blank which are depended for carrying out gap appearance do not happen, and the curvature of a liquid crystal display component is not generated, either. Thereby, the homogeneity within a gap side of a liquid crystal display component, gap precision, and alignment precision can be raised, and the liquid crystal display component in which a high-definition display is possible can be offered.

[Translation done.]

Drawing selection Representative drawing



[Translation done.]

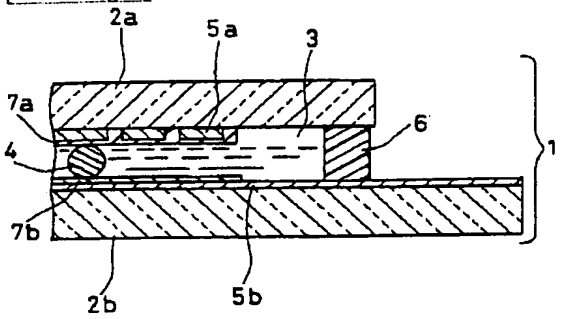
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.

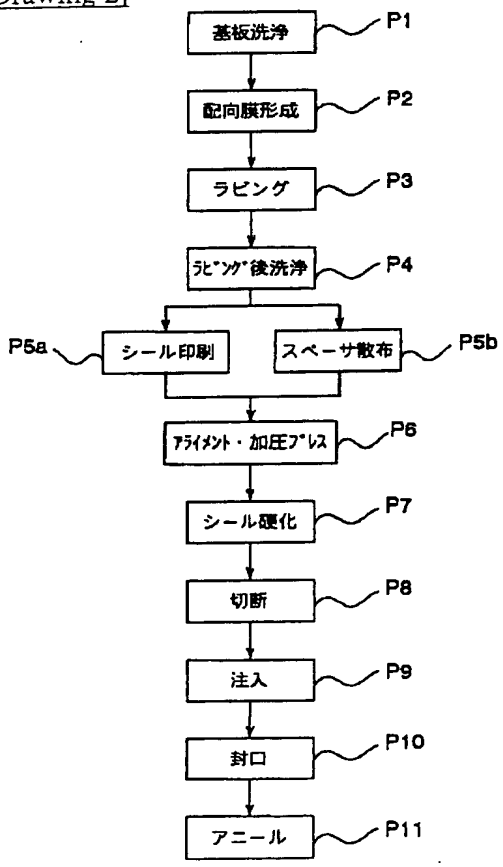
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

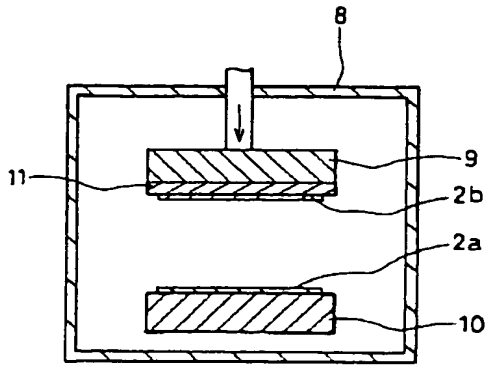
[Drawing 1]



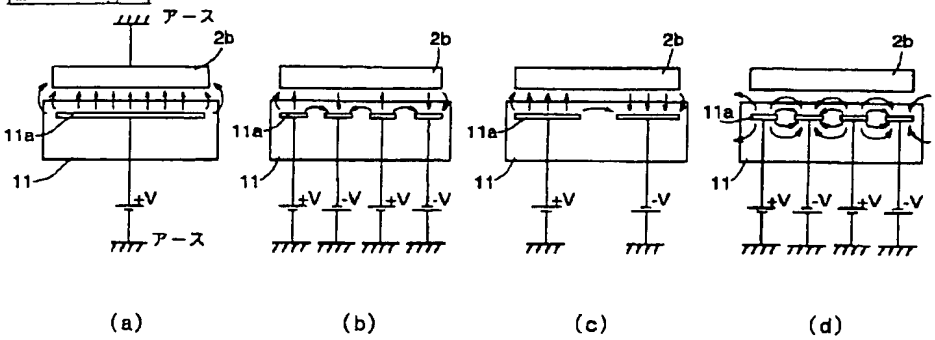
[Drawing 2]



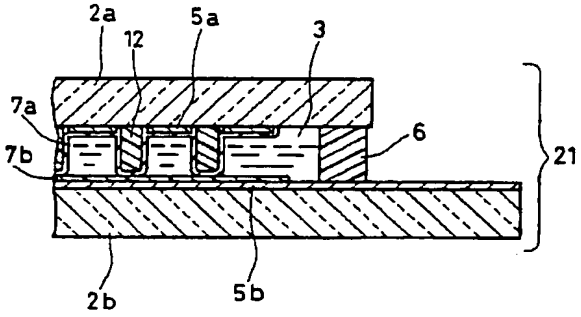
[Drawing 3]



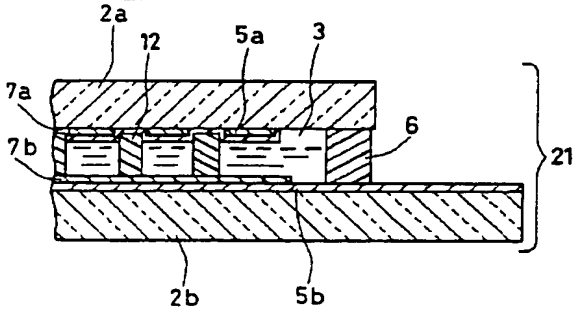
[Drawing 4]



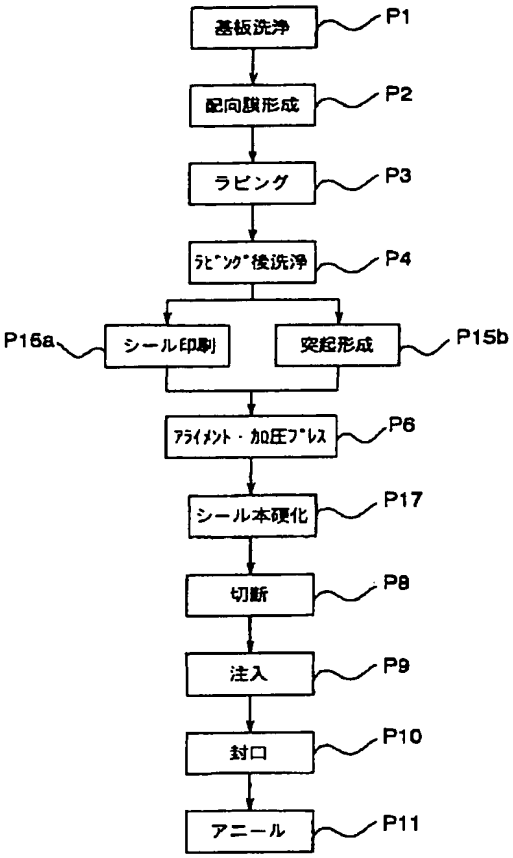
[Drawing 5]



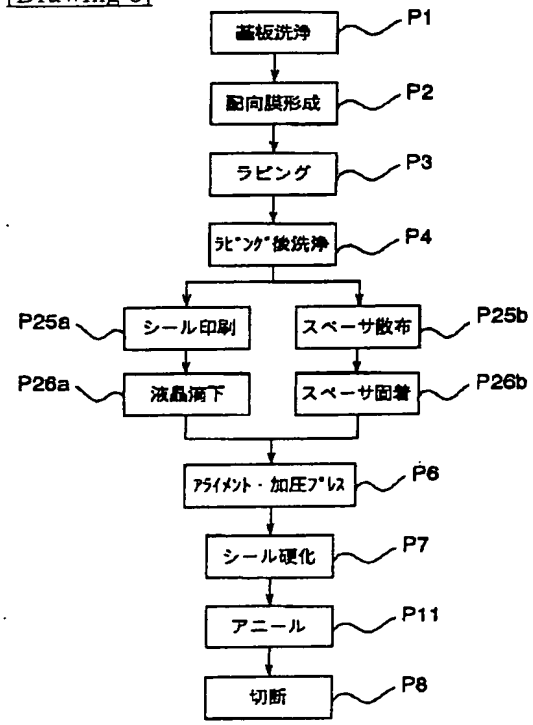
[Drawing 6]



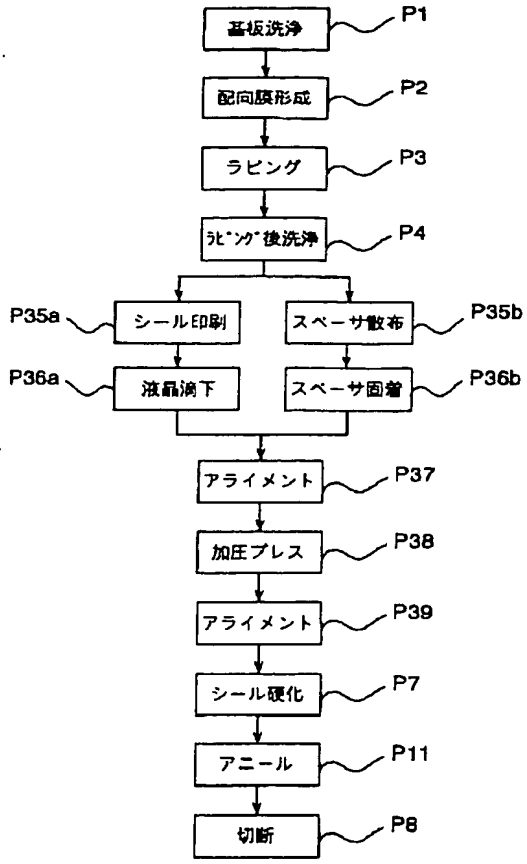
[Drawing 7]



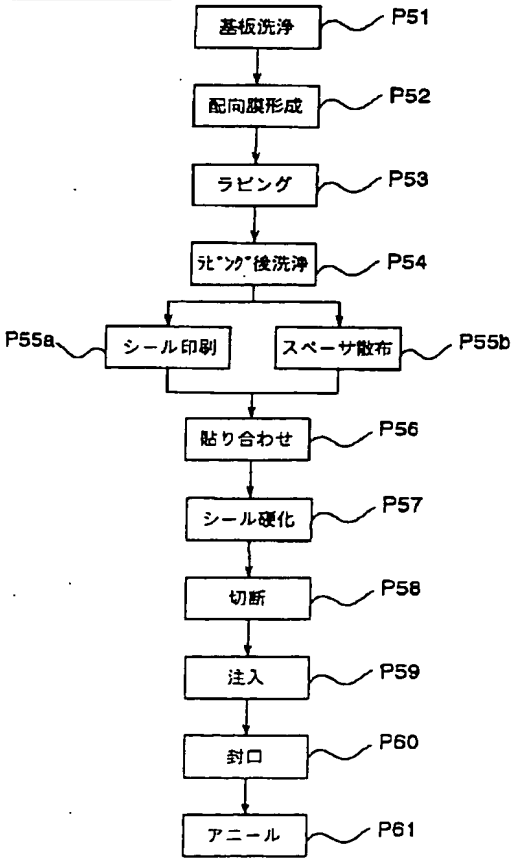
[Drawing 8]



[Drawing 9]


基板洗浄
P1
配向膜形成
P2
ラビング
P3
ﾗﾋﾞﾝｸﾞ後洗浄
P4
P35a
シール印刷
スペーサ散布
P35b
P36a
液晶滴下
スペーサ固着
P36b
アライメント
P37
加圧プレス
P38
アライメント
P39
シール硬化
P7
アニール
P11
切断
P8

[Drawing 10]


基板洗浄
P51
配向膜形成
P52
ラビング
P53
ﾗﾋﾞﾝｸﾞ後洗浄
P54
P55a
シール印刷
スペーサ散布
P55b
貼り合わせ
P56
シール硬化
P57
切断
P58
注入
P59
封口
P60
アニール
P61